

ORIGINAL ARTICLE

Medicine Science 2021;10(3):812-5

Comparison of the hematological parameters of chronic otitis patients with and without cholesteatoma

ID Mehmet Tan, ID Yuksel Toplu

Inonu University, Faculty of Medicine, Department of Otorhinolaryngology, Malatya, Turkey

Received 02 March 2021; Accepted 15 April 2021

Available online 11.06.2021 with doi: 10.5455/medscience.2021.03.071

Copyright@Author(s) - Available online at www.medicinescience.org

Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.



Abstract

Cholesteatoma leads to hearing loss and various complications by causing bone erosion in the middle ear and mastoid in chronic otitis media (COM) patients. The mean platelet volume (MPV), neutrophil-lymphocyte ratio (NLR) and hematological parameters are proinflammatory markers. The purpose of this study is to compare the MPV, NLR and other hematological parameters of chronic otitis patients with and without cholesteatoma. It was planned to retrospectively assess the blood values of inpatients receiving chronic otitis surgery in the period of 2019-2020. Those who received tympanomastoidectomy due to COM with cholesteatoma were in one group, while another group consisted of COM patients without cholesteatoma who received only tympanoplasty. Each group contained 100 individuals. Our study aimed to investigate the relationship of these groups with hemoglobin, neutrophil, platelet, NLR and MPV values. There was a statistically significant difference between the tympanoplasty group and the cholesteatoma group in terms of age, neutrophil and MPV values ($p < 0.05$). The median neutrophil value was calculated as 3.8500 in the tympanoplasty group and 4.7540 in the cholesteatoma group. The median neutrophil value of the patients in the cholesteatoma group was higher. The median MPV value in the tympanoplasty group was 10.3, and that in the cholesteatoma group was 9.7. The median MPV value in the tympanoplasty group was higher. Significant results were obtained in terms of the MPV and neutrophil values. Using a hemogram test which is inexpensive and easily applied as a proinflammatory marker may be an exclusion criterion between diseases.

Keywords: Tympanoplasty, mean platelet volume, cholesteatoma

Introduction

Chronic otitis media (COM) is the inflammatory reaction of the mucosa covering the middle ear accompanied by tympanic membrane perforation exceeding 3 months [1]. Tympanic membrane perforation may be found along with erosion in the middle ear ossicles, sclerosis in the membrane and middle ear, granulation tissue and cholesteatoma. Cholesteatoma is the presence of keratinized squamous epithelium in the middle ear or mastoid cells in COM patients, and in this case, chronic otitis is named as COM with cholesteatoma. Bone erosion is prominent in patients with COM with cholesteatoma. The etiopathogenesis in COM patients is still unclear. Inflammation and oxidative stress may play a role in COM development [2, 3]. Several hematological and biochemical markers are used in showing systemic inflammation. Among these, hemogram parameters which are inexpensively and easily accessed have been studied as

predictive values in many diseases. The neutrophil-lymphocyte ratio (NLR) and mean platelet volume (MPV) are prevalently used parameters. An increase in neutrophil counts and a decrease in lymphocyte counts are an indicator of systemic inflammation. The NLR value has been studied in many diseases as a predictive value of inflammation [4]. Platelet counts also increase in the case of inflammation. As there are volumetric differences in platelets, an increase in the mean platelet volume (MPV) is also another indicator of systemic inflammation [5]. We compared the MPV and NLR values and hematological parameters in those with only membrane perforation and no discharge who received tympanoplasty in dry ears among chronic otitis patients and those with cholesteatoma. We investigated whether or not biochemical inflammation markers affected the decision on tympanoplasty and tympanomastoidectomy in COM.

Materials and Methods

Local ethics board approval was obtained for the study (2020/1222). It was planned to retrospectively assess the blood values of inpatients who received chronic otitis surgery in the period of 2019-2020. Those who received tympanomastoidectomy due to

*Corresponding Author: Mehmet Tan, Inonu University, Faculty of Medicine, Department of Otorhinolaryngology, Malatya, Turkey
E-mail: mehmettan2003@yahoo.com

COM with cholesteatoma constituted one group, while another group consisted of COM patients without cholesteatoma who only received tympanoplasty. The control group included completely healthy individuals. Each group contained 100 individuals. Our study aimed to investigate the relationship of the groups with the hemoglobin, neutrophil, platelet, NLR and MPV values. The routine blood tests of the patients conducted before the surgery were examined. Those with a chronic disease were not included. Patients with cardiac problems, those with liver diseases, thyroid irregularities or rheumatic diseases were excluded. The control group was made up of completely healthy patients. Chronic diseases of the patients were excluded by taking their anamnesis, and they were included after examining and finding that there was no upper respiratory tract infection or other infection. The first group, which was the tympanoplasty group consisted of patients who only had membrane perforation and no discharge in their ear for the last 3 months, and those with erosion or soft tissues in their ossicular structure were excluded. The second group consisted of patients who received tympanomastoidectomy whose surgical pathology result came out as cholesteatoma. In addition to the NLR and MPV values, platelets, hemoglobin, neutrophils, the platelet lymphocyte ratio (PLR), platelet multiplied by neutrophil to lymphocyte ratio (PxN/L) were also assessed.

Results

To compare the difference among the three groups, among parametric tests, one-way ANOVA was used. The Tukey's test

statistic was used to make intragroup comparisons. In data analysis, chi-squared test was used to compare the qualitative variables. $p < 0.05$ was accepted as statistically significant.

There was no statistically significant difference between the tympanoplasty group and the cholesteatoma group in terms of the mean hemoglobin values ($p > 0.05$). There was a significant difference between the tympanoplasty and cholesteatoma groups and the control group in terms of the mean hemoglobin values ($p < 0.05$). The mean hemoglobin level of the individuals in the control group was higher.

There was a significant difference between the tympanoplasty and control groups in terms of age ($p < 0.05$). While the median age in the tympanoplasty group was 27 (min=8; max=64), the median age in the control group was 43 (min=13; max=74). The median age of the control group was higher. There was a significant difference between the tympanoplasty and control groups in terms of MPV ($p < 0.05$). The median MPV value in the tympanoplasty group was 10.3000 (min=8.20; max=13.20), while that in the control group was 9.9000 (min=6.90; max=10.80). The median MPV value of the individuals in the control group was lower (Table 1).

There was no statistically significant difference between the cholesteatoma and control groups in terms of age, platelets, neutrophils, lymphocytes, MPV, PLR, PxN/L or NLR ($p > 0.05$) (Table 2).

Table 1. Comparison of the means of tympanoplasty and control groups

	Tympanoplasty (mean)	Control (mean)	p
Age	31.21	44.24	0.0001
Platelet	266.6400	260.5300	0.0627
Neutrophil	4.1882	4.3224	0.277
Lymphocyte	2.4308	2.4290	0.423
MPV	10.3640	9.6040	0.0001
Platelet /Lymphocyte	115.2824	112.3161	0.410
Plateletx Neutrophil / Lymphocyte	478.9907	480.4309	0.870
Neutrophil /Lymphocyte	1.8262	1.8787	0.434

$p < 0.05$ was accepted as statistically significant

Table 2. Comparison of the means of cholesteatom and control groups

	Cholesteatom(mean)	Control (mean)	p
Age	42.19	44.24	0.378
Platelet	265.6000	260.5300	0.742
Neutrophil	4.7540	4.3224	0.16
Lymphocyte	2.4412	2.4290	0.467
MPV	9.4780	9.6040	0.756
Platelet /Lymphocyte	115.3605	112.3161	0.743
Plateletx Neutrophil / Lymphocyte	559.5902	480.4309	0.269
Neutrophil /Lymphocyte	2.0813	1.8787	0.321

$p < 0.05$ was accepted as statistically significant

There was a significant difference between the tympanoplasty and cholesteatoma groups in terms of age, neutrophils and MPV ($p<0.05$). While the median age of the tympanoplasty group was 27 (min=8; max=64), that of the cholesteatoma group was 43 (min=11; max=83). The median age in the cholesteatoma group was higher. While the median neutrophil count in the tympanoplasty group was 3.8500 (min=2.01; max=7.77), that in the cholesteatoma

group was 4.7540 (min=1.57; max=12.52). The median neutrophil count of the cholesteatoma group was found to be higher. While the median MPV value in the tympanoplasty group was 10.3000 (min=8.20; max=13.20), that in the cholesteatoma group was 9.7000 (min=5.80; max=12.10). The median MPV value in the tympanoplasty group was higher (Table 3).

Table 3. Comparison of the means of tympanoplasty and cholesteatom groups

	Tympanoplasty (mean)	Cholesteatom(mean)	p
Age	31.21	42.19	0.0001
Platalet	266.6400	265.6000	0.929
Neutrophil	4.1882	4.7540	0.018
Lymphocyte	2.4308	2.4412	0.895
MPV	10.3640	9.4780	0.0001
Platalet /Lymphocyte	115.2824	115.3605	0.773
Plataletx Neutrophil / Lymphocyte	478.9907	559.5902	0.211
Neutrophil /Lymphocyte	1.8262	2.0813	0.094

$p<0.05$ was accepted as statistically significant

Discussion

Chronic otitis is the inflammation of the middle ear and mastoid exceeding 3 months. In ears where only the tympanic membrane is perforated, and there is no discharge, tympanoplasty surgery is sufficient. In chronic otitis patients accompanied by cholesteatoma, there is inflammation in the middle ear and the mastoid cavity. Although cholesteatoma is normally a benign lesion, it may lead to ossicular erosion in the mastoid cavity, and secondarily to this, facial paralysis, ossicular structural damage and severe intracranial injuries. Mediators emerging secondarily to inflammation lead to bone erosion by increasing the osteoclast activity [6-8]. The surgery performed on this group of patients is generally tympanomastoidectomy. While there are several biochemical tests showing systemic inflammation, these are usually expensive and time-consuming tests. NLR and MPV are inexpensive, time-efficient values obtained from hemogram tests conducted on every patient. In recent years, their predictive value has been presented in many oncological, cardiac and rheumatic diseases [9-11].

In many studies, NLR activity has been investigated in terms of an increase in inflammation and a reduction in antitumoral effect. Sudden hearing loss, Bell's palsy and laryngeal squamous carcinoma are examples of these [12-15]. Many studies examining chronic otitis patients have studied NLR and MPV values in these patients [16-18]. In one of such studies, no difference was found for the MPV and NLR values between the presence of cholesteatoma and granulation tissue considered as active chronic otitis and inactive chronic otitis. Additionally, a cutoff value could not be found for these parameters [16]. Eryılmaz et al. found the MPV value of patients with pediatric cholesteatoma to be lower in comparison to the control group. They stated that, although their number of patients was low, a low MPV value could be used to estimate cholesteatoma in pediatric patients [18]. As opposed to the case in their study, another study did not find a significant difference in the NLR and MPV values in comparison to the

control group [19]. In our study, there was a statistically significant difference in terms of MPV between the tympanoplasty group and the control group, but not between the cholesteatoma group and the control group. There was also a significant difference between the tympanoplasty and cholesteatoma groups in terms of MPV.

Studies on this topic have found the total oxidant status and levels of the oxidative stress index higher in the COM group. Furthermore, in such a study, the total oxidant status and levels of the oxidative stress index were found higher in the group with cholesteatoma than the group without cholesteatoma [20]. Garca et al. investigated oxidative stress levels, serum myeloperoxidase activity, total antioxidant capacity and nitric oxide levels, and they found these levels higher in the group with cholesteatoma in comparison to the other COM group, but the difference was not statistically significant [21]. The findings in our study that the neutrophil value was higher and that the MPV value was lower in the COM group with cholesteatoma supported the results of the aforementioned studies.

Conclusion

No significant findings could be obtained in terms of the NLR and PLR values, which have been prevalently used in recent years and are obtained from hemogram parameters. In the assessment between the tympanoplasty and cholesteatoma groups, the MPV value in the cholesteatoma group was lower, which supported examples reported in the literature. These test results may be reached by a hemogram test which is inexpensive, fast and easily accessible. While our results were compatible with the literature, new studies to be conducted on larger patient series on this topic may be guiding in the future.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

All authors declare no financial support.

Ethical approval

The study was approved by the Non-Invasive Clinical Research Ethics Committee of Faculty of Medicine, Inonu University, Malatya, Turkey(2020/1222).

References

1. Yilmaz T, Kocan EG, Besler HT, et al. The role of oxidants and antioxidants in otitis media with effusion in children. *Otolaryngol Head Neck Surg.* 2004;131:797-803.
2. Gasparyan AY, Ayvazyan L, Mikhailidis DP, et al. Mean platelet volume: A link between thrombosis and inflammation? *Curr Pharm Des.* 2011;17:47-58.
3. Kurihara A, Toshima M, Yuasa R, et al. Bone destruction mechanisms in chronic otitis media with cholesteatoma: specific production by cholesteatoma tissue in culture of bone-resorbing activity attributable to interleukin-1 alpha. *Ann OtolRhinol Laryngol.* 1991;100:989-98.
4. Roxburgh CS, McMillan DC. Role of systemic inflammatory response in predicting survival in patients with primary operable cancer. *Future Oncol.* 2010;6:149-63.
5. Kilickaya MM, Aynali G, Tuz M, et al. Is there a systemic inflammatory effect of cholesteatoma? *Int Arch Otorhinolaryngol.* 2017;21:42-5.
6. Chole RA, Hughes RM, Faddis BTJ. Keratin particle-induced osteolysis: A mouse model of inflammatory bone remodeling related to cholesteatoma. *J Assoc Res Otolaryngol.* 2001;2:65-71.
7. Ajalloueyan M. Experience with surgical management of cholesteatomas. *Arch Otolaryngol Head Neck Surg.* 2006;132:931-3.
8. Cedrés S, Torrejon D, Martínez A, et al. Neutrophil to lymphocyte ratio (NLR) as an indicator of poor prognosis in stage IV non-small cell lung cancer. *Clin Transl Oncol.* 2012;14:864-9.
9. Vizioli L, Muscari S, Muscari A. The relationship of mean platelet volume with the risk and prognosis of cardiovascular diseases. *Int J Clin Pract.* 2009;63:1509-15.
10. Zahorec R. Ratio of neutrophil to lymphocyte counts-rapid and simple parameter of systemic inflammation and stress in critically ill. *Bratisl Lek Listy.* 2001;102:5-14.
11. Fang HY, Huang XY, Chien HT, et al. Refining the role of preoperative C-reactive protein by neutrophil/lymphocyte ratio in oral cavity squamous cell carcinoma. *Laryngoscope.* 2013;123:2690-9.
12. Kum RO, Ozcan M, Baklaci D, et al. Investigation of neutrophil-to-lymphocyte ratio and mean platelet volume in sudden hearing loss. *Braz J Otorhinolaryngol.* 2015;81:636-1.
13. Wong BY, Stafford ND, Green VL, et al. Prognostic value of the neutrophil-to-lymphocyte ratio in patients with laryngeal squamous cell carcinoma. *Head Neck.* 2016;38(Suppl 1):1903-8.
14. Graziosi L, Marino E, De Angelis V, et al. Prognostic value of preoperative neutrophils to lymphocytes ratio in patients resected for gastric cancer. *Am J Surg.* 2015;209:333-7.
15. Altin F, Alimoğlu Y. Are hematological parameters useful in assessing disease activity in chronic otitis media? *Med Bull Haseki.* 2020;58:52-6.
16. Tansuker HD, Eroglu S, Yenigun A, et al. Can serum neutrophil-to-lymphocyte ratio be a predictive biomarker to help differentiate active chronic otitis media from inactive chronic otitis media? *J Craniofac Surg.* 2017;28:e260-e263.
17. Eryilmaz MA, Derin S. Mean platelet volume as a potential predictor of cholesteatoma in children. *J Craniofac Surg.* 2016;27:e575-8.
18. Yigit E, Celebi OO, Server EA, et al. Neutrophile-to-Lymphocyte Ratio and Mean Platelet Volume in Chronic Otitis Media with or without Cholesteatoma. *Istanbul Med J.* 2018;19:e162-6.
19. Baysal E, Aksoy N, Kara F, et al. Oxidative stress in chronic otitis media. *Eur Arch Otorhinolaryngol.* 2013;270:1203-8.
20. Garca M, Aslan M, Tuna B, et al. Serum myeloperoxidase activity, total antioxidant capacity and nitric oxide levels in patients with chronic otitis media. *J Membrane Biol.* 2013;246:519-24.